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Air Quality Resource Report

Westside Fire Recovery Project

Happy Camp/Oak Knoll and Salmon/Scott River Ranger Districts,
Klamath National Forest
Siskiyou County, California

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Executive Summary

The purpose of this section is to analyze the effects of the project and its alternatives on air quality including ambient air quality standards.

Methodology

Analysis Indicators and Methodology

Compliance with the General Conformity Rule of the Clean Air Act for nitrogen oxides must be analyzed for this project. The conformity rules apply only to the activities occurring in the federal non-attainment areas and makes exceptions for activities with emissions considered to be less than “*de minimis*” values. The *de minimis* for nitrogen oxide emissions is 100 tons per year. The average emissions of nitrogen oxides are estimated through the use of the First Order Fire Effects Model (FOFEM).

The analysis will include an evaluation of the estimated residence time of smoke from project activities and its impact to the worst days haze to determine compliance with the Regional Haze Rule (40 CFR Part 51). Compliance with the Regional Haze Rule requires that states make reasonable progress towards achieving natural visibility conditions in Class I areas. The reasonable progress means that the worst haze days get less hazy and that visibility does not deteriorate on the best days, when compared with the baseline period of 2000 to 2004 (California Air Resource Board 2009). Federal agencies should not prevent this progress through management activities. Methodology is discussed in detail in the Air Quality resource report, available on the project website.

The analysis on roadless resources will focus on the effects to the roadless character, specifically the sense of solitude due to smoke emissions outside of normal wildfire season.

The Council on Environmental Quality recommends that Federal agencies disclose in documentation of their NEPA analyses the effects of climate change for actions that are estimated to emit more than 25,000 metric tons of carbon dioxide equivalents annually (Council on Environmental Quality 2014). This is not a threshold for adverse effects but rather a trigger point for when an analysis of greenhouse gas emissions is needed.

Spatial and Temporal Context

For this project, the spatial boundary includes the project area, the local communities, inventoried roadless areas, and the Marble Mountain Wilderness. Temporally, emissions from mobile sources such as logging trucks and tractors, as well as from prescribed burning, are transient and the impacts are short-lived and the air quality regulations are in terms of one-year emissions. The temporal analyses are on an annual basis and considered short-term. Impacts are considered long-term if they persist for more than a year. The cumulative effects of the mobile source emissions, fugitive dust and smoke emission will be addressed on the 7th field watershed scale.

Affected Environment

The project area is primarily forested federally managed lands with no substantial human-caused emission sources within the area other than emission and fugitive dust from logging and recreation. Other emission contributions will be smoke and haze from seasonal wildland and

prescribed fires from both within and outside the county. According to the California Air Resources Board (<http://www.arb.ca.gov/app/emsmv/emssumcat.php>) the nitrogen oxide emissions are primarily from heavy-duty diesel trucks (such as from the I-5 corridor).

The project is adjacent to the Marble Mountain Wilderness which is designated as a Class I wilderness by the Clean Air Act. The project is adjacent to the Russian Wilderness; however, this is a Class II wilderness and is not subject to the regional haze rule. The worst air quality days are dominated by organic aerosols (particulate matter associated that cause a haze in the air). Organic aerosols peak during the summer months and are strongly correlated with the incidence of wildfires **Invalid source specified..**

Environmental Consequences

Alternative 1

Direct Effects and Indirect Effects

Under this alternative no management action will be taken that will emit nitrogen oxides, greenhouse gases, or impact the visibility in the Marble Mountain Wilderness.

Cumulative Effects

There are no direct or indirect effects for this alternative and therefore no cumulative effects.

Alternatives 2, 3 and 4

Direct Effects and Indirect Effects

The emissions from mobile emissions sources related to the project (trucks, heavy equipment, helicopters, chainsaws, etc.) will be about 26 tons. It is assumed that all of the salvage will occur in one year. The First Order Fire Effects Model estimates there will be about 5 pounds per acre of nitrogen oxides emitted during prescribed burning of activity fuels. There is about 16,245 acres of prescribed fire. It is assumed that 20 percent of the prescribed fire will be implemented in any given year. So the emissions from prescribed fire will be 8 per year. This means the project will not emit more than about 34 tons of nitrogen oxide emissions per year. This is less than the *de minimus* of 100 tons per year maximum allowed to meet regulations in the Conformity Rule.

The prescribed fire proposed in the project area will occur over a few days of any given year. Burning will occur in the spring or fall, outside of the wildfire season. Since the wildfire season is the time of the year when haze is at its worse, the project won't impact visibility on the worst haze days. The likelihood that prescribed burning on a few days any given year will affect the average visibility on the best days over an entire year is small. The likelihood of preventing the progress of the Regional Haze Plan is very low for this alternative. The likelihood of impacting inventoried roadless character is low, smoke is common in the project area from natural sources and the effects are transient.

The greenhouse gas analysis uses the same assumptions as the Ambient Air Quality Standards analysis. Every acre burned will emit approximately 14 metric tons of carbon dioxide equivalents. This alternative proposes prescribed fire on about 16,250 acres of activity fuels. This analysis assumes that 20 percent of the proposed prescribed burning (or about 3250 acres) will

occur in any given year. Therefore, the greenhouse gas emissions from prescribed fire will be about 45,500 metric tons of carbon dioxide equivalents annually. The emissions from heavy equipment (including yarders, loaders and log trucks) will be about 84 metric tons of carbon equivalent per vehicle or about 840 metric tons per year. Helicopter yarding will emit about 186 metric tons per year of carbon dioxide equivalents. Together the total greenhouse gas emission from the alternative will be about 46,525 metric tons per year.

Cumulative Effects

Adding the effects on air quality of alternative 2 to effects of ongoing or reasonably foreseeable future actions in the project area is expected to provide minimal cumulative effects with the oversight of the Siskiyou County Air Pollution Control District. Criteria pollutant and greenhouse gas emissions will degrade air quality cumulatively with activities occurring in the surrounding area. However, these emissions are expected to be minimal and able to disperse readily. Compliance with Burn Day, Marginal Burn Day, and No Burn Day designation, and coordination with and permitting from the Siskiyou County Air Pollution Control District, will minimize cumulative effects of prescribed fire.

Alternative 5

Direct Effects and Indirect Effects

The effects of Alternative 5 are the same as for Alternative 2, 3 and 4 except there are 17,455 acres of burning proposed. This is about 8.7 tons per year of nitrogen oxides emitted from prescribed burning. There is also about 30 percent the amount of salvage activities in Alternative 5 than in the other alternatives. So the emissions from heavy equipment are expected to be 30 percent of the other alternatives which is about 7.5 tons per year. The helicopter yarding will emit about 0.3 tons per year for this alternative. The total nitrogen oxide emissions are estimated to be 16.5 tons per year. The likelihood of the progress of the Regional Haze Plan will remain the same as in Alternative 2. The effects to the inventoried roadless character are the same as for alternatives 2, 3 and 4. Greenhouse gas emissions will be 49,180 metric tons of carbon dioxide equivalents.

Cumulative Effects

The cumulative effects are the same as in alternative 2.

Compliance with law, regulation, policy, and the Forest Plan

All alternatives are compliant with the Clean Air Act and the Conformity Rule. The project will not prevent the progress of the State of California's Regional Haze Plan as required by the Regional Haze Rule, and will be consistent with the Forest Plan as displayed on the Forest Plan consistency checklist, available on the project website.

Air Quality Resource Report

Introduction

The purpose of this report is to analyze the effects of the project and its alternatives on air quality including ambient air quality standards. The analysis will also include discussion on haze impacts on Wild and Scenic River, Inventory Roaded Areas and Wilderness values associated with good air quality.

Methodology

Ambient Air Quality Standards

Siskiyou County is identified as attainment or unclassified for carbon monoxide, sulfur oxides, lead, respirable particulate matter and fine particulate matter for both state and federal standards. There is no further state or federal regulation for project activities that generate these emissions and they will not be analyzed further. Siskiyou County is in “non-attainment or transitional” status for the state 8-hour ozone standards. Therefore, compliance with the General Conformity Rule of the Clean Air Act for nitrogen oxides must be analyzed for this project. The conformity rules apply only to the activities occurring in the federal non-attainment areas and make exceptions for activities with emissions considered to be less than “*de minimis*” values. The *de minimis* for nitrogen oxide emissions is 100 tons per year.

Nitrogen oxides and the greenhouse gas emissions for mobile sources (heavy equipment and log trucks) were estimated using an emission-factor model as outlined in *Desk Reference for NEPA Air Quality Analysis* (USFS 1995, page 3.3.1). Emissions from helicopters are estimated using emissions factors found in environmental documents for the Hollister 115kV Powerline Reconductoring project (PG&E 2009). Emission factors are in tons per hour. Therefore, several assumptions were made in order to estimate the amount of emissions per year from mobile sources. This analysis assumes all ground-based equipment will run (moving or idling) for 5 hours a day for 80 days a year (4 months) and that there will be 10 pieces of equipment running for that time throughout the project area. Helicopters will be assumed to be in use for 8 hours a day for 4 weeks times three helicopters. The analysis also assumes that all the equipment uses diesel fuel. These factors do not account for all the emission-reduction technology for vehicles and fuel currently in place; therefore, the estimates of emissions over-estimate what is likely to result from equipment use.

The average emissions of nitrogen oxides from prescribed burning were estimated using the First Order Fire Effects Model (FOFEM). The average greenhouse gas emissions from prescribed fire are also estimated using the First Order Fire Effects Model. The modeling is based on a Douglas-fir – tanoak - madrone forest under moderate weather conditions with a natural or activity fuel load. The defaults of the model in this mode are used for the model runs. The First Order Fire Effects Model is recognized by the Forest Service Pacific Southwest Region as being the most current and accurate analysis tool available for emissions prediction (Reinhardt et al. 1997). It is based on extensive research in western forest ecosystems.

Regional Haze Rule

The Regional Haze Rule of 1999 (40 CFR Part 51) requires a Regional Haze Plan for Class I designated airsheds. These include National Parks and Wilderness established before 1977.

Human-related sources of haze include industry, motor vehicles, agricultural and forestry burning, and dust from disturbed soils. The primary concern is the reduction of visibility in wilderness areas. The Regional Haze Rule requires that states make reasonable progress towards achieving natural visibility conditions in Class I areas. Reasonable progress means that the worst haze days get less hazy *and* that visibility does not deteriorate on the best days, when compared with the baseline period of 2000 to 2004 (California Air Resource Board, 2009). Federal agencies should not prevent this progress through management activities. The analysis will include an evaluation of the estimated residence time of smoke from project activities and its impact to the worst and best-days haze to determine compliance with the Regional Haze Rule.

The haze species concentrations are measured as part of the IMPROVE (Interagency Monitoring of Protected Visual Environments) monitoring network deployed throughout the United States. The visibility conditions for Marble Mountain Wilderness are currently monitored by an IMPROVE monitor in the Trinity Alps. The 24 days with the worst visibility are averaged each year and used to determine the worst days' visibility.

The amount of light extinction affects visibility or the clarity of objects viewed at a distance by the human eye this is measured in "deciviews" which are the amount of obstruction the haze in the air causes; higher numbers mean you cannot see as far into the distance.

Inventoried Roadless Areas

Projects within roadless areas must analyze the environmental consequences, including irreversible and irretrievable commitment of resources, to roadless area characteristics. The analysis on the roadless resource is focused on the potential effects to roadless characteristics. The roadless area characteristic that is likely affected by impacts to air resources is the sense of solitude due to the smoke emissions outside of normal wildfire season.

Greenhouse Gas Emissions

Logging and prescribed burning activities release greenhouse gases into the air which can contribute to climate change. Currently there are no thresholds for greenhouse gas emissions for forest management activities. Emissions of greenhouse gases are commonly expressed in a common metric which is the carbon dioxide equivalent. Some greenhouse gases are more potent than others and this metric allows for the direct comparison of impacts between different activities with different ratios of greenhouse gases emissions. The Council on Environmental Quality recommends that Federal agencies disclose in documentation of their NEPA analyses the effects of climate change for actions that are estimated to emit more than 25,000 metric tons of carbon dioxide equivalents annually. This is not a threshold for adverse effects but rather a trigger point for when an analysis of greenhouse gas emissions is needed.

Analysis Indicators

- Compliance with the Conformity Rule
 - Estimated emissions of nitrogen oxide per year compared to *de minimus*.
- Compliance with the Regional Haze Rule
 - Estimated days of visibility impacted in Class I areas (Wilderness)
 - Likelihood of preventing progress of the California Regional Haze Plan
- Effects to Roadless Area characteristics
- Estimated greenhouse gas emissions in metric tons of carbon dioxide equivalents.

Spatial and Temporal Context

It is difficult to determine the spatial analysis area for effects to air quality due to the mobility of air. For this project, the spatial boundary includes the project area, the local communities, inventoried roadless areas, and the Marble Mountain Wilderness. Temporally, emissions from mobile sources such as logging trucks and skidding equipment, as well as from prescribed burning, are transient and the impacts are short-lived; air quality regulations are in terms of 1-year emissions. In light of this, the temporal analyses are on an annual basis which is considered short-term. Impacts are considered long-term if they persist for more than a year. The accumulated effects of the mobile source, fugitive dust and smoke emissions will be addressed on the 7th field watershed scale.

Affected Environment

The project area is primarily forested federally managed lands with no substantial human-caused emission sources within the area other than emission and fugitive dust from logging and recreation. Other emission contributions will be smoke and haze from seasonal wildland and prescribed fires from both within and outside the county. According to the California Air Resources Board (<http://www.arb.ca.gov/app/emsmv/emssumcat.php>) the nitrogen oxide emissions are primarily from heavy-duty diesel trucks (such as from the I-5 corridor).

The project is adjacent to the Marble Mountain Wilderness which is designated as a Class I wilderness by the Clean Air Act. The project is adjacent to the Russian Wilderness; however, this is a Class II wilderness and is not subject to the regional haze rule. The worst air quality days are dominated by organic aerosols (particulate matter associated that cause a haze in the air). Organic aerosols peak during the summer months and are strongly correlated with the incidence of wildfires (California Air Resource Board, 2009).

Environmental Consequences

Alternative 1

Direct and Indirect Effects

Under this alternative no management action will be taken that will emit nitrogen oxides, greenhouse gases, or impact the visibility in the Marble Mountain Wilderness. The Roadless Area characteristics in the Inventoried roadless Areas will not be affected. There will be no emissions or haze created that can impact the Wild and Scenic River outstandingly remarkable value along the North Fork Salmon River.

Cumulative Effects

There are no direct or indirect effects for this alternative and, therefore, no cumulative effects.

Alternative 2, 3 and 4

Direct and Indirect Effects

The First Order Fire Effects Model estimates that there will be approximately 5 pounds per acre of nitrogen oxides emitted during prescribed burning of activity fuels. There is proposed up to about 16,245 acres of prescribed burning treatments in the project. This analysis assumes that 20% of the proposed prescribed burning (or about 3250 acres) will occur in any given year. So

the annual emission will be about 16250 pounds per year or 8 tons per year of nitrogen oxide emissions from prescribed fire. The emissions from the heavy equipment (including yarders, loaders and log trucks) will be about 2.5 tons per vehicle per year or 25 tons per year. The nitrogen oxide emissions from helicopter use will be about 1850 pounds per year or 1 ton per year. This adds to 34 tons per year of nitrogen oxide emissions from this alternative. This is less than the *de minimus* of 100 tons per year maximum allowed to meet regulations in the Conformity Rule.

The prescribed fire proposed in the project area will occur over a few days of any given year. Burning will occur in the spring or fall, outside of the wildfire season. Since the wildfire season is the time of the year when haze is at its worse, the project won't impact visibility on the worst haze days. The likelihood that prescribed burning on a few days any given year will affect the average visibility on the best days over an entire year is small. The likelihood of preventing the progress of the Regional Haze Plan is very low for this alternative.

Smoke emissions will occur only while burning is taking place (typically 1-3 days at a time). The indirect effects of the smoke will be impacts to the sense of solitude. Smoke is common in the project area and can be expected even in remote areas of the Forest during wildfire season. However, the smoke from the project will occur outside of the normal wildfire season, interrupting the sense of remoteness and solitude expected in a roadless area. The emissions are transient and will only occur in the short term. The project meets all air quality regulations and a smoke plan will be approved by the Siskiyou County Air Pollution Control District prior to implementation. The impacts to the sense of solitude and remoteness in the roadless area are minor.

The greenhouse gas analysis uses the same assumptions as the Ambient Air Quality Standards analysis. An estimated 0.12 metric tons per acre and 11.5 metric tons per acre of emissions of methane and carbon dioxide respectively from prescribed fire in activity fuels will be created. One metric ton of methane is equivalent to 21 metric tons of carbon dioxide equivalent. Therefore, prescribed fire on one acre of activity fuels will emit about 2.5 metric tons per acre of carbon dioxide equivalent. So every acre burned will emit approximately 14 metric tons of carbon dioxide equivalents. This alternative proposes prescribed fire on about 16,250 acres of activity fuels. This analysis assumes that 20% of the proposed prescribed burning (or about 3250 acres) will occur in any given year. Therefore, the greenhouse gas emissions from prescribed fire will be about 45,500 metric tons of carbon dioxide equivalents annually. The emissions from heavy equipment (including yarders, loaders and log trucks) will be about 84 metric tons of carbon equivalent per vehicle or about 840 metric tons per year. Helicopter yarding will emit about 408,960 pounds per year or 186 metric tons per year of carbon dioxide equivalents. Together the total greenhouse gas emission from the alternative will be about 46,525 metric tons per year.

It is not currently feasible to quantify the indirect effects of individual or multiple projects on global climate change and, therefore, determining significant effects of those projects or project alternatives on global climate change cannot be made at any scale (USFS, 2009). Because greenhouse gases mix readily into the global pool, it is not currently possible to ascertain the indirect effects of emissions from single or multiple sources (projects). Also, because the large majority of Forest Service projects are extremely small in the global atmospheric carbon dioxide context, it is not presently possible to conduct quantitative analysis of actual climate change effects based on individual or multiple projects (USFS, 2009).

Cumulative Effects

Adding the effects on air quality of alternative 2 to effects of ongoing or reasonably foreseeable future actions in the project area is expected to provide minimal cumulative effects with the oversight of the Siskiyou County Air Pollution Control District. Criteria pollutant and greenhouse gas emissions will degrade air quality cumulatively with activities occurring in the surrounding area. However, these emissions are expected to be minimal and able to disperse readily. Compliance with Burn Day, Marginal Burn Day, and No Burn Day designation, and coordination with and permitting from the Siskiyou County Air Pollution Control District, will minimize cumulative effects of prescribed fire.

As GHG emissions are integrated across the global atmosphere, it is not possible to determine the cumulative impact on global climate from emissions associated with any number of particular projects. Nor is it expected that such disclosure will provide a practical or meaningful effects analysis for project decisions (USFS, 2009).

Alternative 5**Direct and Indirect Effects**

The effects of Alternative 5 are the same as for Alternative 2, 3 and 4 except there are 17,455 acres of burning proposed. This is about 8.7 tons per year of nitrogen oxides emitted from prescribed burning. There is also about 30% the amount of salvage activities in Alternative 5 than in the other alternatives. So the emissions from heavy equipment are expected to be 30% of the other alternatives which is about 7.5 tons per year. The helicopter yarding will emit about 0.3 tons per year for this alternative. The total nitrogen oxide emissions are estimated to be 16.5 tons per year. The likelihood of the progress of the Regional Haze Plan will remain the same as in Alternative 2. The effects to the inventoried roadless character are the same as for alternatives 2, 3 and 4. Greenhouse gas emissions will be 49,180 metric tons of carbon dioxide equivalents.

Cumulative Effects

The cumulative effects are the same as in alternative 2.

Compliance with law, regulation, policy, and the Forest Plan

The Alternative is compliant with the Clean Air Act and the Conformity Rule. The project will not prevent the progress of the State of California's Regional Haze Plan as required by the Regional Haze Rule. The character of the roadless area will only be affected on the short-term and will not have any permanent change to the characteristics.

References Cited

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Appendix A: FOFEM Output

TITLE: Results of FOFEM model execution on date: 1/30/2015

FUEL EMISSIONS CALCULATIONS

Region: PacificWest
 Cover Type: SAF 234 - Douglas-fir - Tanoak - Pacific Madrone
 Fuel Type: Natural
 Fuel Reference: FOFEM 241

	Emissions flaming	-- lbs/acre smoldering	total
PM 10	5	488	493
PM 2.5	4	414	418
CH 4	1	251	252
CO	10	5513	5523
CO 2	2770	22438	25208
NOX	5	0	5
SO2	2	18	20

	Consumption tons/acre	Duration hour:min:sec
Flaming:	0.78	00:01:00
Smoldering:	9.13	00:49:15
Total:	9.91	
Unit Average Combustion Efficiency:	0.69	